AF/2874

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	**David S. Sumida et al.**	Examiner:	Sung H. Pak
Serial No.:	**09/894,347**	Art Unit:	2874
Filed:	June 28, 2001	Our Ref:	B-4034 618348-2
For:	"GUIDED MODE LASER APPARATUS WITH IMPROVED CLADDING STRUCTURE AND A METHOD OF FABRICATING THEREOF"	Date:	October 28, 2004
		Re:	***Appeal to the Board of Appeals***

BRIEF ON APPEAL

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from the Final rejection, dated March 3, 2004, for the above identified patent application. The Applicant submits that this Appeal Brief is being timely filed, since the notice of Appeal was filed on September 1, 2004.

REAL PARTY IN INTEREST

The present application has been assigned to HRL Laboratories, LLC of Malibu, CA.

STATUS OF CLAIMS

Claims 1 - 26 are the subject of this Appeal and are reproduced in the accompanying appendix.

STATUS OF AMENDMENTS

No Amendment After Final Rejection has been entered.

SUMMARY OF THE INVENTION

The invention described and claimed in the present application relates to a novel solid state waveguided structure (p. 5, ll. 11-14) such as for a solid state laser device or a guided optical amplifier (p. 5, ll. 16-18). The structure consists of a core formed of a lasing material (p. 13, ll. 4-5), and a cladding formed of laser-inactive material (p. 13, l. 6) overlying the core (p. 12, ll. 12-13). The novelty of the invention resides in the use of a particular material, lutetium-aluminum-garnet (LuAG) doped with ions, as the lasing material of the core (p. 16, ll. 1-2).

ISSUES

Issue 1: Whether Claims 1, 3-5, 9, 12, 13, 15-17, 21, and 24-26 are patentable under 35 U.S.C. 103(a) over U.S. Patent No. 5,852,622 to Meissner (hereinafter "Meissner") in view of U.S. Pat. No. 6,288,833 to Kasamatsu (hereinafter "Kasamatsu").

Issue 2: Whether Claims 2, 6-8, 10-11, 14, 18-20, and 22-23 are patentable under 35 U.S.C. 103(a) over Meissner and further in view of U.S. Patent No. 5,936,984 to Meissner (hereinafter "Meissner '984").

GROUPING OF CLAIMS

For each ground of rejection which the Applicant contests herein and which applies to more than one claim, such additional claims, to the extent separately identified and argued below, do not stand or fall together.

THE ARGUMENT

Issue 1: Whether Claims 1, 3-5, 9, 12, 13, 15-17, 21, and 24-26 are patentable under 35 U.S.C. 103(a) over U.S. Patent No. 5,852,622 to Meissner (hereinafter "Meissner") in view of U.S. Pat. No. 6,288,833 to Kasamatsu (hereinafter "Kasamatsu").

In the final Office Action of March 3, 2004, the Examiner rejects Claims 1, 3-5, 9, 12, 13, 15-17, 21, and 24-26 under 35 U.S.C. 103(a) as being unpatentable over Meissner in view of Kasamatsu. Applicants respectfully disagree with the conclusion that the Examiner has made with regard to the obviousness of modifying the Meissner device to use the lasing material taught by Kasamatsu, and submit that the rejection of Claims 1, 3-5, 9, 12, 13, 15-17, 21, and 24-26 based on Meissner and Kasamatsu should be overturned on appeal.

The Examiner's rejection of each specific claim appealed herein as based on the disclosure of Meissner and Kasamatsu is addressed in turn below.

Regarding Claim 1, the Examiner asserts that the Meissner reference discloses a solid state waveguide with all the limitations set forth in the claims, except that it does not teach the use of LuAG material. The Examiner further finds that the Kasamatsu reference discloses the use of LuAG material, and asserts that this material is known and used in the art of forming solid state laser devices. The Examiner further asserts that such materials are advantageously used to produce solid state lasers that produce 900nm to 1,000nm wavelength light. The Examiner concludes that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the Meissner device to use LuAG material, because it would have been desirable to have a laser material for forming a solid state laser device capable of producing 900nm to 1,000nm wavelength light.

Applicants respectfully disagree with the Examiner's conclusion. As those skilled in the art know, finding combinations of materials that can be used together as core and cladding for a laser device is a matter of trial and error and not unsubstantial experimentation, and therefore those skilled in the art would not assume that a

combination of materials can be used together. As set forth in the Declaration Under 37 C.F.R. §1.132 of Applicant Hans W. Bruesselbach previously submitted in response to the final Office Action, and which Applicants respectfully invite the members of the Board to consider as part of this Appeal, those skilled in the art are well aware of the necessity of actual experimentation with every particular combination of materials for the cladding and core of a solid state laser waveguide device because the preferred method of encasing a core in cladding, diffusion bonding, produces acceptable results with only very specific combinations of materials. Thus, those of skill in the art know that crystals for forming a laser waveguided structure cannot be selected arbitrarily but rather must be selected by studying the thermal expansion coefficients (CTE) and other physical properties of the crystals and by conducting physical experiments on actual prototypes.

Because of this lack of predictability in the art, those skilled in the art would infer very little, if anything, beyond the specific, concrete examples disclosed in the prior art. This is an important point to consider with respect to the references cited by the Examiner. For instance, although Meissner discloses in Figure 6 a structure that appears to be similar to the presently claimed invention, there is no discussion nor reference to it as being a waveguide structure anywhere in the disclosure. All of Meissner's embodiments of waveguiding structures are shown to have a guiding layer on only one or two sides of the core, not encapsulating the core as per claim 1. This is of great significance because, as those skilled in the art know, no attempt to encase a laser-active crystal with Sapphire (by far the most widely known and used cladding material) on all six sides has succeeded, and surrounding a laser-active crystal with Sapphire on four sides has been accomplished but with considerable difficulty.

Meissner's Figure 6 embodiment is very specifically described to comprise a Nd-doped YAG core and an undoped YAG cladding. As those skilled in the art know only too well, using the same material (YAG) for both the core and the cladding offers significant advantages in terms of thermal performance as well as ease of bonding due to nearly identical crystalline structures (the only difference being due to the dopant atoms). Disclosing this embodiment taught the skilled person that a fully-clad core can

be produced by using YAG in both layers, and not one iota more. Similarly, Kasamatsu taught the skilled person that LuAG can be used as the core material in a multi-layer structure with a single-mode core waveguide and multimode waveguides disposed on opposite sides of the single-mode waveguide, all of which reside on a substrate – and not one iota more. There is simply no teaching in any of these references that would even hint to the skilled person that LuAG possesses properties that would allow it to be substituted for the doped YAG core of Meissner, especially since Meissner only disclosed a very obvious and convenient cladding – the very same material, YAG.

Thus, those of ordinary skill in the art would not in fact have found it obvious to try a combination of two different materials disclosed in two separate patents for two different purposes, nor would they have presumed that such a combination was more likely to succeed than any other combination. Indeed, such a combination was not even obvious to try to those skilled in the art, given the utter lack of predictability in the art. The Examiner's perceived *desirability* of making lasers that produce 900nm-1,000nm light does not lead to or support finding Applicants' claimed device *obvious*. Applicants thus respectfully submit that those of skill in the art would not in fact find it obvious to try to fabricate the device of Meissner with LuAG material simply because Kasamatsu discloses the use of LuAG as a core, and respectfully submit that claim 1 is novel and nonobvious in view of the art.

Claims 3-5, 9, 12 and 25 are dependent from claim 1. In view of the above discussion of claim 1, Applicants respectfully submit that these claims are also novel and nonobvious in view of the art.

Claim 13 is a method claim that corresponds to apparatus claim 1. The Examiner has rejected this claim for the same exact reasons as claim 1. Applicants therefore submit that the above discussion directed to the nonobviousness of claim 1 is equally applicable to claim 13, and for the very same reasons submit that claim 13 is novel and nonobvious in view of the art.

Claims 15-17, 21, 24 and 26 are dependent from claim 13. In view of the above discussion of claim 1 as applied to claim 13, Applicants respectfully submit that these claims are also novel and nonobvious in view of the art.

Issue 2: Whether Claims 2, 6-8, 10-11, 14, 18-20, and 22-23 are patentable under 35 U.S.C. 103(a) over Meissner and further in view of U.S. Patent No. 5,936,984 to Meissner (hereinafter "Meissner '984").

In the final Office Action, the Examiner rejects Claims 2, 6-8, 10-11, 14, 18-20, and 22-23 under 35 U.S.C. 103(a) as being unpatentable over Meissner '622 in view of Meissner '984. These claims are all dependent on claim 1 or 13. In view of the above discussion of claim 1 and its applicability to claim 13, Applicants respectfully submit that claims 2, 6-8, 10-11, 14, 18-20, and 22-23 are also novel and nonobvious in view of the art.

CONCLUSION

For the reasons advanced above, Appellants respectfully contend that each pending claim is novel and nonobvious in view of the art, and therefore patentable. Therefore, reversal of all rejections and re-opening of the prosecution is respectfully solicited.

I hereby certify that this correspondence is being deposited with the United States Post Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

October 28, 2004
(Date of Transmission)

Mia Kim
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10/28/04
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Attachments

Claims

1. A solid state waveguided structure, comprising:

(a) a core fabricated of a lutetium-aluminum-garnet material doped with ions, said core having an outer surface; and

(b) a cladding fabricated of a laser-inactive material, said cladding diffusion-bonded to said outer surface of said core.

2. The structure as claimed in claim 1, wherein said structure comprises:

(a) a central section having a first end and a second end, said first end being terminated at a first bottleneck section and said second end being terminated at a second bottleneck section; and

(b) two substantially identical end sections, a first end section and a second end section, wherein said first end section is associated with said first bottleneck section, and said second end section is associated with said second bottleneck section, thereby making said end sections integral with said central section.

3. The structure as claimed in claim 1, wherein said core comprises a rod, said rod having a polygonal cross-section.

4. The structure as claimed in claim 1, wherein said laser-inactive material further comprises yttrium-aluminum-garnet material.

5. The structure as claimed in claim 1, wherein said ions are selected from a group comprising ytterbium, neodymium, or thulium.

6. The structure as claimed in claim 2, wherein said central section is substantially in a form of a cylinder.

7. The structure as claimed in claim 2, wherein each of said end sections is substantially in a form of a cylinder.

8. The structure as claimed in claim 2, wherein a combined length of said first bottleneck section and of said first end section is between about 6 millimeters and about 8 millimeters.

9. The structure as claimed in claim 3, wherein said polygonal cross-section is substantially in a form of a square.

10. The structure as claimed in claim 6, wherein said cylinder has a diameter between about 1.5 millimeters and about 2.5 millimeters.

11. The structure as claimed in claim 7, wherein said cylinder has a diameter between about 6 millimeters and about 7 millimeters.

12. The structure as claimed in claim 9, wherein said square has a dimension of a side between about 0.5 millimeters and about 1.5 millimeters.

13. A method of fabricating a solid state waveguided structure with improved characteristics, comprising:

(a) providing a core fabricated of a lutetium-aluminum-garnet material doped with ions, said core having an outer surface; and

(b) ensconcing said core in a cladding fabricated of a laser-inactive material, said cladding diffusion-bonded to said outer surface of said core.

14. The method as claimed in claim 13, wherein said structure comprises:

(a) a central section having a first end and a second end, said first end being terminated at a first bottleneck section and said second end being terminated at a second bottleneck section; and

(b) two substantially identical end sections, a first end section and a second end section, wherein said first end section is associated with said first bottleneck section, and said second end section is associated with said second bottleneck section, thereby making said end sections integral with said central section.

15. The method as claimed in claim 13, wherein said core comprises a rod, said rod having a polygonal cross-section.

16. The method as claimed in claim 13, wherein said laser-inactive material further comprises yttrium-aluminum-garnet material.

17. The method as claimed in claim 13, wherein said ions are selected from a group comprising ytterbium, neodymium, or thulium.

18. The method as claimed in claim 14, wherein said central section is substantially in a form of a cylinder.

19. The method as claimed in claim 14, wherein each of said end sections is substantially in a form of a cylinder.

20. The method as claimed in claim 14, wherein a combined length of said first bottleneck section and of said first end section is between about 6 millimeters and about 8 millimeters.

21. The method as claimed in claim 15, wherein said polygonal cross-section is substantially in a form of a square.

22. The method as claimed in claim 18, wherein said cylinder has a diameter between about 1.5 millimeters and about 2.5 millimeters.

23. The method as claimed in claim 19, wherein said cylinder has a diameter between about 6 millimeters and about 7 millimeters.

24. The method as claimed in claim 21, wherein said square has a dimension of a side between about 0.5 millimeters and about 1.5 millimeters.

25. The structure as claimed in claim 1, wherein said cladding envelops all of said core.

26. The method as claimed in claim 13, wherein said cladding envelops all of said core.